AP Calculus

3.4 / 18 $\quad f(x) = \dfrac{(x^2+1)\cdot\cot x}{3-\cos x\csc x}$

$(x^2+1)(\cot x)$ is a product

is it the whole thing?

$g(x) = (x^2+1) \qquad h(x) = \dfrac{\cot x}{3-\cos x\csc x}$

$(gh)' = g'h + gh'$

$* = (2x)\left(\dfrac{\cot x}{3-\cos x\csc x}\right) + (x^2+1)\left(\dfrac{\cot x}{3-\cos x\csc x}\right)'$

$\dfrac{d}{dx}\left(\dfrac{\cot x}{3-\cos x\csc x}\right) = \dfrac{(-\csc^2 x)(3-\cos x\csc x)-(\cot x)(-(-\csc^2 x))}{(3-\cos x\csc x)^2}$

$\dfrac{d}{dx}\left(\dfrac{f}{g}\right) = \dfrac{f'g-fg'}{g^2}$

$\dfrac{d}{dx}(\cos x\csc x) = \dfrac{d}{dx}\left(\cos x\left(\dfrac{1}{\sin x}\right)\right)$

$\left[\cot x = \dfrac{\cos x}{\sin x}\right]$

$* = \dfrac{2x\cot x}{3-\cos x\csc x} + \dfrac{(x^2+1)(-3\csc^2 x+\cos x\csc^3 x-\cot x\csc^2 x)}{(3-\cos x\csc x)^2}$

$$f(x) = \frac{(x^2+1)\cdot \cot x}{3 - \cos x \csc x}$$

$$f(x) = \frac{g(x)}{h(x)} =$$

$$\frac{\left([2x][\cot x] + [x^2+1][-\csc^2 x]\right)\left(3 - \cos x \csc x\right) - (x^2+1)(\cot x)(\csc^2 x)}{(3 - \cos x \csc x)^2}$$

$$\left(\frac{g}{h}\right)' = \frac{g'h - gh'}{h^2}$$

$$f(x)=\frac{(x^2+1)\cdot\cot x}{3-\cos x\csc x}$$

$$f(x)=\frac{\left[(x^2+1)\left(\frac{\cos x}{\sin x}\right)\right]\sin x}{\left[3-\frac{\cos x}{\sin x}\right]\sin x}$$

$$\left(\frac{f}{g}\right)'=\frac{f'g-fg'}{g^2}$$

$$f(x)=\frac{(x^2+1)(\cos x)}{3\sin x-\cos x}$$

$$f'(x)=\frac{\left[(2x)(\cos x)+(x^2+1)(-\sin x)\right](3\sin x-\cos x)-(x^2+1)(\cos x)(3\cdot\cos x+\sin x)}{(3\sin x-\cos x)^2}$$

Oct 2-7:27 AM

3.3 17)

$$f(x) = \frac{g(x) = (\sin x \sec x)}{h(x) = (1 + x\tan x)}$$

$$f'(x) = \frac{(\sec^2 x)(1+x\tan x) - \tan x(\tan x + x\sec^2 x)}{(1+x\tan x)^2}$$

$$= \frac{\sec^2 x(1 + x\sec^2 x\tan x) - \tan^2 x(-x\tan x\sec^2 x)}{(1+x\tan x)^2}$$

$$= \frac{\sec^2 x - \tan^2 x}{(1+x\tan x)^2}$$

$\sin x \sec x =$

$\sin x \left(\frac{1}{\cos x}\right) =$

$\frac{\sin x}{\cos x} = \tan x$

$\frac{d}{dx}(x\tan x) =$

$(1)\tan x + (x)(\sec^2 x)$

$\frac{\sin^2}{\cos^2} + \frac{\cos^2}{\cos^2} = \frac{1}{\cos^2}$

$\tan^2 x + 1 = \sec^2 x$

$-\tan^2 x \quad -\tan^2 x$

$1 = \sec^2 x - \tan^2 x$

CALCULUS LOOKS at TRIG

$$\lim_{x\to 0} \frac{\sin x}{x} = 1 \quad ; \quad \lim_{x\to 0} \frac{1-\cos x}{x} = 0$$

$$\lim_{x\to 0} \left(\frac{1-\cos x}{x}\right)\left(\frac{1+\cos x}{1+\cos x}\right) =$$

$$\lim_{x\to 0} \frac{1-\cos^2 x}{x(1+\cos x)} = \lim_{x\to 0} \frac{\sin^2 x}{x(1+\cos x)}$$

$$= \lim_{x\to 0} \left(\frac{\sin x}{x}\right)\left(\frac{\sin x}{1+\cos x}\right) = 0$$

$\sin x \to 0$, $1+\cos x \to 2$

Algebra looks at trig

$$\frac{d}{dx}(\sin x) = \cos x \qquad \frac{d}{dx}(\cos x) = -\sin x$$

$$\frac{d}{dx}(\tan x) = \sec^2 x \qquad \frac{d}{dx}(\cot x) = -\csc^2 x$$

$$\frac{d}{dx}(\sec x) = \sec x \tan x \qquad \frac{d}{dx}(\csc x) = -\csc x \cot x$$

2.6/p 163/41

$$f(x) = \begin{cases} \frac{\tan(kx)}{x}, & x < 0 \\ 3x + 2k^2, & x \geq 0 \end{cases}$$

$$\lim_{x \to 0^-} \frac{\tan(kx)}{x}$$

$$= \lim_{x \to 0^-} \frac{\sin(kx)}{x}\left(\frac{1}{\cos(kx)}\right)$$

$$= \lim_{x \to 0^-} k\left(\frac{\sin(kx)}{kx}\right)\left(\frac{1}{\cos(kx)}\right)$$

$$= k(1)(1) = k$$

$$\lim_{x \to 0^+} 3x + 2k^2$$

$$= 2k^2$$

$$k = 2k^2$$

$$k - 2k^2 = 0$$

$$k(1 - 2k) = 0$$

$k = 0$ or $k = \frac{1}{2}$

$\cancel{0}$

for $k = \frac{1}{2}$, is function continuous?